

Geomagnetic field Secular Variation in Pacific Ocean: A first Bayesian reference curve based on Hawaiian Lava Flows

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Abstract: During the last decades, the increased number of high quality reference palaeomagnetic data from archaeological artifacts and lava flows permit the reconstruction of the past secular variation path of the geomagnetic field at regional and global scale. Such reference secular variation curves are particularly important as they consist of a unique source of information about the variations of the Earth's magnetic field and the geodynamo processes at the mantle-core boundary. Nevertheless, in most cases the available data are discontinuous and cover only the last few millennia. The long and continuous volcanic activity of the Hawaiian Islands, however, offers a unique opportunity to obtain continuous regional secular variation curves that cover a much longer time interval. We present here the first, full geomagnetic field vector reference curves for central Pacific Ocean based on historical and radiocarbon dated Hawaiian lava flows from the last 10000 years. Most of the reference data come from the Big Island of Hawaii, but some directional data came also from the Island of Maui. The new curves are calculated using the most recent developments on the reference curves building based on hierarchical Bayesian modeling (Lanos & Philippe, 2015). As expected, the obtained curves are well established for the last 5 millennia, where most of the reference data are concentrated while for older periods they are accompanied by larger error envelopes. The new curves are compared with global geomagnetic field models predictions and are used for the identification of sharp and rapid variations of the Earth's magnetic field in the central Pacific. They clearly show some interesting variation features in both direction and intensity of the Earth's magnetic field in the Pacific area that however are not always contemporaneous with sharp geomagnetic field variations previously observed

in Europe. The possible non dipolar origin of such fluctuations is an interesting feature of the geomagnetic field behavior.

Keywords: Secular Variation; Bayesian modeling; Lava flows; Hawaii

References :

Lanos, Ph., Philippe, A., 2015: Event Model: A robust Bayesian toll for chronological modeling. <https://hal.archives-ouvertes.fr/hal-01241720>.